

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

To:

D'Agostini, Giovanni
D'AGOSTINI ORGANIZZAZIONE SRL
Via G. Giusti 17
I-33100 Udine
ITALIE

Date of mailing
(day/month/year)

16.03.2004

Applicant's or agent's file reference
newsystemPCT-5

IMPORTANT NOTIFICATION

International application No.
PCT/IT 02/00780

International filing date (day/month/year)
11.12.2002

Priority date (day/month/year)
27.12.2001

Applicant
NEW SYSTEM SRL et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international
preliminary examining authority:



European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized Officer

Baumann, H

Tel. +49 89 2399-2131



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/IT 02/00780

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-10 received on 02.03.2004 with letter of 27.02.2004

Claims, Numbers

1-11 received on 02.03.2004 with letter of 27.02.2004

Drawings, Sheets

1/2, 2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT (PCT Article 36 and Rule 70)

| | | |
|---|---|--|
| Applicant's or agent's file reference newsystemPCT-5 | FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) | |
| International application No. PCT/IT 02/00780 | International filing date (day/month/year) 11.12.2002 | Priority date (day/month/year) 27.12.2001 |
| International Patent Classification (IPC) or both national classification and IPC H05K3/10 | | |
| Applicant NEW SYSTEM SRL et al. | | |

| | |
|----|--|
| 1. | This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36. |
| 2. | This REPORT consists of a total of 5 sheets, including this cover sheet. |
| | <input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT). These annexes consist of a total of 15 sheets. |

| | |
|------|--|
| 3. | This report contains indications relating to the following items: |
| I | <input checked="" type="checkbox"/> Basis of the opinion |
| II | <input type="checkbox"/> Priority |
| III | <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| IV | <input type="checkbox"/> Lack of unity of invention |
| V | <input checked="" type="checkbox"/> Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| VI | <input type="checkbox"/> Certain documents cited |
| VII | <input type="checkbox"/> Certain defects in the international application |
| VIII | <input type="checkbox"/> Certain observations on the international application |

| | |
|---|---|
| Date of submission of the demand 16.07.2003 | Date of completion of this report 16.03.2004 |
| Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 | Authorized Officer Batev, P Telephone No. +49 89 2399-7970  |

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/IT 02/00780**

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|-------------------------------|-------------|------|
| Novelty (N) | Yes: Claims | 1-11 |
| | No: Claims | none |
| Inventive step (IS) | Yes: Claims | 1-11 |
| | No: Claims | none |
| Industrial applicability (IA) | Yes: Claims | 1-11 |
| | No: Claims | none |

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1: DE 198 17 530 A (INSTITUT FÜR DIAGNOSTIKFORSCHUNG GMBH AN DER FREIEN UNIVERSITÄT BERLIN) 14 October 1999 (1999-10-14)

D2: US-A-3 661 304 (MARTINEZ ET AL) 9 May 1972 (1972-05-09)

1. Although claim 1 is directed to a system, the wording of said claim is a mixture of device features and method steps. The category of said claim is, therefore, not clear (see the Guidelines, Chapter III-4.1).

The same objection applies to independent claim 6 which although directed to a machine contains expressions like "is controlled" and "is moved".

2. Insofar as the examiner can understand the claims, the following is pointed out:

2.1. The present invention appears to relate to a process and machine for depositing a liquefied material on a support surface.

2.2. Document D1 discloses (abstract) a process and device for production of multilayer thin-film structures, wherein a liquefied material is deposited pixel-by-pixel on a substrate in the form of fine drops or sprays, the deposition being controlled by a computer.

The solution proposed in claim 1 is distinguished this state of the art at least in that

- (i) means are provided for applying pressure having value p_1 at the start of deposition and pressure having value $p_2 < p_1$ during deposition of the liquefied material; and
- (ii) said means, during the non-operational phase, are able to apply a supply pressure having value $p_3 > p_1$.

The subject matter of claim 1 appears, therefore, novel (Article 33(2) PCT).¹

2.3. Document D2, which relates to a drop generator for use in high speed printing, discloses applying initial higher pressure to the liquid in order to produce immediately a

stream of drops and avoid clogging or fouling of the passages.

None of the other cited documents, which reflect the technological background, discloses or gives an incitement to the specific solution defined in claim 1.

In view of the available prior art, the subject matter of claim 1 appears, therefore, to involve an inventive step (Article 33(3) PCT).

2.4. Independent claim 6 is directed to a machine for use in the system of claim 1 and, consequently, comprising the features (i) and (ii) mentioned above.

2.5. Claims 2 - 5 and 7 - 11 which define preferred embodiments of the invention are dependent on claim 1 or 6, respectively, and as such also appear to meet the requirements of the PCT in respect of novelty and inventive step.

DESCRIPTIONSYSTEM TO FORM A LAYERING OF ELECTRONICALLY-
INTERACTIVE MATERIAL

The object of this patent is a system for the formation of a
5 layering of electronically-interactive material, according to the
characteristics of main claim.

Technical Field

By the term electronically-interactive material, we mean
any kind of material which is capable of electronically interacting
10 both in an active sense, such as through conductivity, or in a
negative sense, such as through insulation, and does not exclude
other parameters such as the typical on/off function which
characterises micro-processors.

The invention is used preferably, but not exclusively, for
15 the formation of a layering of electronically-interactive material,
such as in: the manufacture of electronic circuit boards; the
creation of screens with a layer of electronically-interactive
material to project images from a flat screen to create displays,
which may also be flexible, directly incorporating a computerised
20 system which does not exclude the function of a microprocessor
with both organic and non-organic material, including the
function of intelligence which may or may not be artificial,
similar to cerebral functions, and also visualisation or non-
visualisation with different grades of variable luminosity materials
25 by means of electronically induced phenomena which cover the
entire range of the spectrum.

Background Art

According to the current state of the technology, the

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formation of a layering, either composed of a single layer or a number of layers, is carried out by either mechanical, chemical or photo-chemical methods. The techniques of layering with mechanical systems are slow and not very suitable for the

5 miniaturisation and precision which modern electronic techniques need to acquire.

For example, in order to create electronic circuit boards, which is one of the main, although not exclusive, uses of this invention, either photographic or photo-engraving techniques

10 are used, and which are far superior to mechanical systems.

In spite of this, modern technology requires techniques which are more rapid and efficient, and which also have miniaturisation and precision capacities superior to those achieved up until now, if possible.

15 It is well known that, even with photo-engraving techniques, since a photo-sensitive layer has to be engraved, it is not possible to create designs and miniaturised circuits below a certain dimension. That is, it is not possible to go below certain values, which are determined by the minimum distance between

20 two engravings, otherwise it would make the thin layer between them unstable because, if it is too thin, it could be easily detached or ruined. As a general rule, an acceptable value for the ratio of the distance between one engraving and another and the thickness of the layer >1 . In fact, if the said ratio were less than 1,

25 the height of the section of the layer would be greater than the width, so the risk of breakage and a resulting short circuit between two adjacent circuits would be high.

DE-19817530A discloses a process and device for the production of a

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thin-multilayer structure.

- US-3661304 discloses a pressure impulse apparatus for initiating formation of fluid drops such as ink, in high speed printing, wherein the drops are selectively placed on a paper web,
- 5 providing a primary liquid supply at a constant pressure and starting means for applying an higher pressure impulse, said starting means including an auxiliary liquid supply.

Aim of the invention

- The aim of this invention is to overcome the aforementioned
- 10 drawbacks and to allow a layer of electronically-interactive material to be rapidly and quickly formed on a surface, which has the maximum precision even with the smallest of designs and which has an extremely low cost.

Explanation of the invention

- 15 The problem is overcome according to the characteristics described in the main claim.

Advantages

The advantages obtained with this solution are the following:

- Speed of the process.
- 20 - Maximum simplicity.
- Maximum precision.
- Maximum miniaturisation of the structures designed and integrated in the layer.
- Maximum reliability, safety, robustness and duration of the
- 25 layering.
- Overall reduction of manufacturing costs.
- Respect for the environment with the elimination of all waste materials or pollutants.

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Detailed description of an application

These and other advantages will be shown in the following description and attached drawings of a preferential application of the solution, the details of which are intended to be an example and
5 not a limitation.

Figure 1 is a schematic view of the mechanical solution of the application machine for the formation of a layering of electronically-interactive material on a support sub-layer, such as in the manufacturing of an electronic circuit board.

10 Figure 2 is a three-dimensional schematic view of the feeding system of the distribution unit for the material used for the formation of the said layering of electronically-interactive material.

Figure 3 is a view of the distribution unit for the material
15 used for the formation of the said layering of electronically-interactive material.

Figure 4 is a schematic front view of the various components of the distribution unit of the system according to the attached claims.

20 Figure 5 is a three-dimensional schematic view of a machine which embodies the system for the formation of a layering of electronically-interactive material, according to this invention.

Detailed description of the solution illustrated in the drawings

With reference to Figure 1, it is clear from the
25 characteristics in the claims that the formation of the layer of electronically-interactive material is carried out according to an innovative technique compared with previous technology, as follows:

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- A support (a board of plastic material S, for example) is positioned on a mobile bed 2, where the movement of the mobile bed 2 is controlled and programmed by a microprocessor according to a given co-ordinate (Y).
- 5 - Above, there is a distribution unit for punctiform jets of the liquefied material to be deposited (3) in order to form the said layer on the said support (S). The distribution unit is programmed to move transversally in a controlled manner by a microprocessor, similar to that of a traditional inkjet printer;
- 10 with the said distributor having a number of nozzles for the distribution of points the equivalent of pixels, which are able to cover a certain area equal to $n \times d$, where "n" is the number of nozzles which are sprayed in line, and "d" is the distance along the line from one nozzle to another, with a layout, for example,
- 15 along three lines alternately disposed, 1, 2, 3, for a length of 70mm.
- The forward progress of the underlying support is in steps of 70mm, up to the complete deposit on the surface of the support in question (S).
- 20 Figure 2 illustrates the feeding system of the liquefied material (which may be coloured, for example, with conductive powder in suspension in the various containers with a respective electro-induced vibration mixer), which comes from a main container 4 with a cover for loading 40.
- 25 This container has two tubes for the liquefied material: one is the feed line 41 by means of a solenoid check valve 410 to a pressure equaliser and regulator 5 which will be described in detail in the successive function, and a return line 71 from a

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recovery and recycling container of the same liquefied material 7, the function of which will be described later.

In this description, the liquefied material means the said material used for the formation of the said layering of electronically-interactive material used to cover the said support or plate of plastic material "S".

From the bottom of the said pressure equaliser and regulator 5, there is a pipe 53 which leads to the bottom of a buffer 6 with an upper air chamber "A". The liquid to be deposited settles in the lower part "L", where there are pipes which take it the nozzle chamber forming the distribution means for point-type sprays (31) which forms the said distributor. The said buffer 6 is suitable, therefore, to contain the said liquefied electronically-interactive material "L", while the upper air chamber "A" acts as a pressure compensator, that is as a damper, being able to increase or reduce according to the emission and/or consumption of the liquefied material and, therefore, increase or reduce the request for material from the intermediate pressure equaliser and regulator container (5).

The said buffer 6 is positioned above and is joined to the distribution means for point-type sprays (31). Also, the said pressure equaliser and regulator 5 may move upwards and downwards parallel to the up and down movement of the said distribution means for point-type sprays (31) and the said buffer 6 on guide carriages 52, and may also be finely regulated in height with respect to the height of the said buffer (6) and the said distribution means for point-type sprays (31) so that it may regulate the pressure either higher or lower for the difference in

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level according to the principle of communicating vessels, with the pressure variation induced by impeding the principle of communicating vessels by means of the presence of the said air chamber "A" in the said buffer 6. In this way, by being able to
5 regulate the pressure either higher or lower according to the programmed value by means of the computer control with a micro-processor, the highest functionality is achieved.

It thus becomes possible to comply to the following conditions according to the program:

- 10 i, start distribution at the start of the transversal movement according to "X" with a distribution pressure p_1 ;
- ii, vary the said pressure immediately afterwards to the value p_2 , where $p_2 < p_1$, with repetition of the cycle for every transversal movement of distribution-deposit "X";
- 15 iii, vary the distribution again to a value of p_3 , so that $p_3 > p_1$, for a cleaning operation of the filters where the said material passes, to carry out a maintenance cycle during a non-operational phase, that is, material not being deposited according to "i" or "ii".

According to Figure 4 which schematically illustrates the
20 distribution unit 3, we can see that, at the side of the said distribution means for point-type sprays (31), on one side there is an ultra-violet light transmitter 34 which has the function of polymerising the fluid distributed on the surface of the support material (S), with the liquid being distributed in a form to be
25 polymerised due to the action of ultra-violet rays, and on the opposite side there is an ultra-sonic distance sensor 32 which detects the distance of the underlying support (S) from the depositing bed and transmits the respective data to the processor so

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that, according to the program, it brings it closer, takes it further away or holds it at the same distance.

There is also a television camera 33 to the side, to view the surface of the support zone subject to the deposit in question, both
5 for the fine tuning by means of reference points according to a well known technique, and for checking the correct distribution, depositing, regularity of the covering, etc.

According to Figure 5, we can see a three-dimensional schematic view of a machine which includes all of this equipment
10 in order to use the system according to the characteristics in the claims. The machine has a base 1 which includes the electric and computerised electronic system, with a control computer therefore, and which also has the function of supporting the mobile bed 2 which is movable longitudinally by means of worm screws 20, the
15 rotation of which is controlled by the said computer. The support panel "S", such as an electronic circuit board (in plastic material, for example), on which the layer of electronically-interactive material is to be formed, is placed on the said bed.

A further transversal worm screw 30, the rotation of which
20 is controlled by the said computer, is positioned above the said mobile bed (2). This transversal screw 30 carries the said distribution unit as described 3.

The system for feeding the liquefied material is connected laterally to the said distribution unit (3).

25 The feeding system is carried out, as already stated, in a controlled way by means of the said three containers 4, 5 and 6 with their respective piping.

At the back, block 340 forms the ultra-violet ray generator

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which feeds the said ultra-violet ray transmitter 34.

Going back to the said main feed chamber 4 and cover 40, it must be made clear that it also has the return pipe 71 which comes from a lateral tank 7 fixed at the side of the mobile bed 2, in order
5 to be covered during the washing phase of the said distribution means for point-type sprays (31) during the non-operational phase of washing the filter with a higher pressure p2.

In this case, the fluid which is fed for the washing phase, which is neither polluted or damaged, is recovered by the said tank
10 from below the nozzles in the said distributor means for point-type sprays (31), and taken by means of the said pipe 71 to the said main container 4.

All three of the containers 4, 5 and 6 have a vibration unit inside to keep the liquid constantly in motion during the feeding
15 operation, in order to keep the suspended substance, which is heavier than the liquid, uniformly distributed (eg. copper powder for the conductivity of the material, pigments for the insulating material, etc.)

The ultra-violet (UV) ray device 34 advantageously works at
20 room temperature and, because it heats up, it is cooled down at the same time according to a controlled temperature by suitable equipment which is part of the machine. In this way, the polymerisation of the deposited material is carried out at room temperature without damaging the material or the support, and
25 without compromising the functionality of the entire depositing unit (3).

The distribution nozzles for the material to be polymerised by means of the distribution unit for point-type sprays (31) are

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advantageously conformed to supply punctiform (pixel-by-pixel) sprays equal to 1 pixel at time in logical succession.

There are one or more rows of distribution nozzles. More rows of nozzles or distributors may be foreseen in order to deposit
5 different materials.

An example of different materials could be the following, for example:

- conductive material;
- insulating material;
- 10 - covering or protective material.

A further advantage is that the system includes the activation or shut-down of the said ultra-violet ray polymerisation device (34) in a controlled way to make the following possible:

- the direct polymerisation immediately after being deposited, or
15 - to fix it.

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CLAIMS

1. A system for the formation of a layering of electronically-
interactive liquefied material, which is solidified /polymerised, on
a support surface formed by a sheet/card (S), characterised by the
5 fact that:

- a computer controlled machine is used, with a mobile support
bed which goes backwards and forwards (2, 20, Y) with a
transversal bridge passing over it and which has transversal
guide means for the alternate transversal movement, above the
10 said mobile support bed, of a distribution unit for the material
(3), in which there is a distribution means for point-type
sprays (31) at programmed differential pressure, equipped with
a series of punctiform nozzles to distribute respective points of
the liquefied material, which correspond to pixels, in a
15 controlled, programmed way;
- the said sheet/card (S) is fastened on the surface of the said
mobile support bed (2), and
 - (i) the said mobile support bed (2), on which there is the said
sheet/card (S), is moved forward (Y) according to the program
20 below the said bridge and below the said distribution unit (3);
 - (ii) the said distribution unit (3) is moved transversally above
the said sheet/card (S), and the said distribution means deposits, by
means of points (31), and according to a programmed design, at
least one layer of the said electronically-interactive material, with
25 differentiation of the distribution pressure of the said liquefied
material at two different values p_1 and p_2 , where:
"p1" is the pressure at the start of the distribution and depositing
phase, and

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"p2" is the continuous pressure during the distribution of the deposit, wherein

$p1 > p2$;

- phases (i) and (ii) being repeated until the whole of the required surface interested area of the said support sheet/card (S) is covered, and being provided further means that, during the non-operational phase, are able to apply a supply pressure "p3" > "p1" in order to clean a respective filtering system in the feeding system of the said liquefied distribution-depositing material.
- 2. A system according to the previous claim, characterised by the fact that, to the side of the said distribution means for point-type sprays (31), there is an ultra-violet ray head which is suitable for polymerising the said electronically-interactive liquefied distribution-depositing material.
- 3. A system according to the previous claim 2. , characterised by the fact that the said ultra-violet polymerisation head is electronically controllable to supply the energy required to fix the said material on the said support (S).
- 4. A system according to the previous claims, characterised by the fact that, to the side of the said distribution means for point-type sprays (31), there is an ultrasonic distance sensor (32) which detects the distance of the said distribution means (3) from the depositing surface on the said sheet/card (S), and which transmits the respective data to the computerised means which controls the movement of the said distribution means (3).
- 5. A system according to the previous claims, characterised by the fact that, to the side of the said distribution means for point-type

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sprays (31), a television camera (33) is installed, which has the function of controlling and fine tuning the start, and checking the regularity and conclusion of the distribution-depositing operation.

6. Computer controlled machine for the depositing of a liquefied
5 electronically-interactive material on a sheet/card (S), for implementing the system according to the previous claims, characterised by the fact that it includes:

- a base (1) to support the mobile bed (2) which is moved longitudinally (Y) by means of a worm screw (20) whose
10 movement is controlled by a computer, and for the support and fixing of the said sheet/card "S" on which the layer of electronically-interactive material is to be formed;
- a bridge above the said base with a transversal shaft (30) which also has a worm screw, to move a distribution unit for the
15 electronically-interactive material to be deposited (3) in an orthogonal direction (X) controlled by the said computer;
- the said distribution unit (3), with a pressurised distribution means with a series of nozzles for pixel punctiform sprays, fed by a buffer container (6) and above with the fed liquid material in the
20 lower part "L" and air chamber "A", while to the side there is a pressure balance and regulation chamber (5) with its feed line (51) on the bottom (L) of the said buffer, and supply of the said liquid material from a feeder container-tank (4), where all of these containers (4, 5 and 6) have an agitation means and in which, the
25 said pressure balance and regulation chamber (5) has a level indicator (51) and is guided parallel to the said distribution means for point-type sprays (31) when rising and lowering, and in which there are means for varying and regulating the height of the said

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pressure balance and regulation container (51) to increase or reduce the pressure on the said buffer container either positively or negatively due to the difference in the level in a regulated way.

7. A computer controlled machine according to the previous claim
5 6, characterised by the fact that the said feed container -tank (4) includes a connection to a tank (7) located at the side and which is covered by the said distribution means for point-type sprays (31), so that the said liquid material is able to be recovered and recycled at a recycle pressure of "p3", which is higher than the said

10 distribution-depositing pressures "p1" and "p2", to carry out a cleaning cycle of the respective filtering means located upstream of the nozzles in the said distribution means.

8. A computer controlled machine according to claims 6 and/or 7, characterised by the fact that the said punctiform spray nozzles
15 are positioned in a longitudinal direction (Y) with respect to the direction of movement of the said bed (2) in at least one row.

9. A computer controlled machine according to claims 6 to 8, characterised by the fact that the said punctiform spray nozzles are positioned in a longitudinal direction (Y) with respect to the
20 direction of movement of the said bed (2) in a number of rows.

10. A computer controlled machine according to any of the previous claims 6-9, characterised by the fact that, to the side of the said distribution means, there are:

- cooled means for transmitting ultra-violet rays for
25 polymerising the said material which is deposited (34);
- means for controlling the distance from the surface to be deposited (32) and
- a television camera (33),

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which are all connected interactively to send their respective data to the machine's microprocessor in order to carry out the respective control operations according to the program.

11. A computer controlled machine according to any of the
5 previous claims 6-10, characterised by the fact that it has more than one distribution device (3) in the distribution unit for materials with differentiated electronically-interactive characteristics, among which at least one is actively electronically-interactive and one is non-actively electronically-
10 interactive, or an insulator.

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From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

WRITTEN OPINION (PCT Rule 66)

To:

D'Agostini, Giovanni
D'AGOSTINI ORGANIZZAZIONE SRL
Via G. Giusti 17
I-33100 Udine
ITALIE

Date of mailing
(day/month/year)

04.12.2003

Applicant's or agent's file reference
newsystemPCT-5

REPLY DUE

within 3 month(s)
from the above date of mailing

International application No.
PCT/IT02/00780

International filing date (day/month/year)
11.12.2002

Priority date (day/month/year)
27.12.2001

International Patent Classification (IPC) or both national classification and IPC
H05K3/10

Applicant

NEW SYSTEM SRL et al.

1. This written opinion is the **first** drawn up by this International Preliminary Examining Authority.

2. This opinion contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☐ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

3. The applicant is hereby **invited to reply** to this opinion.

When? See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also: For an additional opportunity to submit amendments, see Rule 66.4.
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis.
For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.

4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: 27.04.2004

Name and mailing address of the international preliminary examining authority:



European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized Officer

Batev, P

Formalities officer (incl. extension of time limits)

Mader, D

Telephone No. +49 89 2399-2744



I. Basis of the opinion

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed"*):

Description, Pages

1-10 received on 19.07.2003 with letter of 07.07.2003

Claims, Numbers

1-11 received on 19.07.2003 with letter of 07.07.2003

Drawings, Sheets

1/2, 2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☒ the claims, Nos.: 12
☐ the drawings, sheets:

5. ☐ This opinion has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

6. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been and will not be examined in respect of:

☐ the entire international application,

☒ claims Nos. 1-11

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):

☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 1-11 are so unclear that no meaningful opinion could be formed (*specify*):

see separate sheet

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☐ no international search report has been established for the said claims Nos.

2. A written opinion cannot be drawn due to the failure of the nucleotide and/or amino acid sequence listing to comply with the Standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the Standard.

☐ the computer readable form has not been furnished or does not comply with the Standard.

Re Item III

Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. Although claim 1 is directed to a system, the wording of said claim is a mixture of device features and method steps. The category of said claim is, therefore, not clear (see the Guidelines, Chapter III-4.1).

Similarly, some of the remaining device claims contain references to method steps which render their category unclear. It is advisable, therefore, to replace expressions like "is electronically controlled" (claim 1) and "is moved" (claim 6) with "is electronically controllable" and "is movable", respectively.

2. It appears that the terminology used is not consistent throughout the description and the claims (Rule 10.2 PCT). For example, more than one term is used for the technical feature denoted by reference sign 31: "point-type sprays", "points", "distribution means" and "distribution unit".

Moreover, the use in the claims of a plurality of terms for one feature (e.g. "sheet" or "card" or "panel" for the feature denoted by reference sign S) makes it difficult to determine the matter for which protection is sought, and places an undue burden on others seeking to establish the extent of the protection.

3. Further lack of clarity arises from the use of the expressions "may be" (claims 1 - 5, 7) and "it is possible to" (claim 1) as these expressions leave doubt as to whether the features which follow are part of the claimed subject matter or not.

4. The word "basically" used in claim 1 has no well-recognised meaning and renders the definition of the subject-matter unclear. It should be replaced by a more precise wording or deleted (Guidelines, Chapter III-4.5).

5. The newly introduced phrase in the beginning of claim 1, i.e. "in which a starting ... of said material" only repeats technical features already defined in the original claim 1 (see original page 12, lines 5-12). This phrase or the respective original passages of claim 1 should be, therefore, deleted.

6. Similarly, the repetition in the dependent claims of features already defined in the main claim to which these dependent claims refer should be avoided. Thus, the phrase "for

formation ... support panel (S)" in claims 2, 4 and 5 should be deleted (see also the Guidelines, Chapter III-5.1).

7. The references in the dependent claims should be corrected. In particular, dependent claims 7, 10 and 11 which are directed to a machine should not refer to claims 1 - 5. It is also advisable to specify in claim 3 whether the reference "the previous claim" concerns claim 1 or 2.

8. In view of the above objections, the requirements of Article 6 PCT regarding conciseness and clarity are not met. It is, therefore, not at present possible to carry out a full examination of the application.

The applicant is therefore requested to file suitable amendments upon which the further prosecution of the application is to be based.

The applicant is requested to file the amendments by way of replacement pages in the manner stipulated by Rule 66.8(a) PCT. In particular, fair copies of the amendments should be filed preferably in triplicate.

In order to facilitate the examination of the conformity of the amended application with the requirements of Article 34(2)(b) PCT, the applicant is requested to clearly identify the amendments carried out, no matter whether they concern amendments by addition, replacement or deletion, and to indicate the passages of the application as filed on which these amendments are based (see also Rule 66.8(a) PCT). If the applicant regards it as appropriate these indications could be submitted in handwritten form on a copy of the relevant parts of the application as filed.



Via G.Giusti n.17 - 33100 UDINE - ITALY
 Tel.0039.0432.507332 Fax0039.0432.519242 / 26034
 Email: dagostini@server.dagostini.it
<http://www.dagostini.it>

Our ref: newsystemPCT-5
 Udine, February 27, 2004
 By fax and DHL

EUROPEAN PATENT OFFICE
 INTERNATIONAL PRELIMINARY
 EXAMINING AUTHORITY
 Erhardtstrasse 27
 80298 MÜNCHEN
 Germania

ATTN: Mr P Batev - Examiner

RE: International Patent Application No. PCT/IT02/00780 filed on 11-12-2002
 in the name of NEW SYSTEM S.R.L..

With reference to your written opinion (PCT Rule 66) of 4-12-2003, please find herewith enclosed the amended pages of the description and claims in triplicate, in which all newly added parts are in bold and deletions are strikethrough and the retyped description and claims in triplicate.
 No new subject matter has been introduced.

In particular:

1. The expression "*is electronically controlled*" was detected in claim 3, not in claim 1, and as suggested has been changed with "**is electronically controllable**"; the same has been made with "**is movable**" as suggested in claim 6.
2. The description reference 31 has been uniformized in the whole description and claims with "**distribution means for point-type sprays**"; the same has been made for the expression "*sheet...card...panel*" using "**sheet/card**".
3. The expression "*may be*" has been changed with "**is**" and the expression "*it is possible to*" has been changed with "**are able to**".
4. The word "*basically*" has been deleted.
5. The adding of "*in which a starting ... of said material*" in claim 1 has been deleted.
6. The similar features in the introduction of dependent claims 1, 2, 5 has been deleted.
7. The references in dependent claims 7, 10, 11 has been put in reference with claim 6in conformity. In claim 3 the previous claim has been defined as claim 2.

Considering the amendments overcoming the objections and acceptable, we are waiting for the opinion.

Yours faithfully,

The Applicant's Representative
 D'Agostini dr. Giovanni

Encl.:

- amended pages of the description and claims in which all newly added parts are in bold and parts deletions are strikethrough in triplicate;
- retyped description and claims in triplicate.

DESCRIPTION

SYSTEM TO FORM A LAYERING OF ELECTRONICALLY-
INTERACTIVE MATERIAL

The object of this patent is a system for the formation of a
5 layering of electronically-interactive material, according to the
characteristics of main claim.

Technical Field

By the term electronically-interactive material, we mean
any kind of material which is capable of electronically interacting
10 both in an active sense, such as through conductivity, or in a
negative sense, such as through insulation, and does not exclude
other parameters such as the typical on/off function which
characterises micro-processors.

The invention ~~may be~~ is used preferably, but not
15 exclusively, for the formation of a layering of electronically-
interactive material, such as in: the manufacture of electronic
circuit boards; the creation of screens with a layer of
electronically-interactive material to project images from a flat
screen to create displays, which may also be flexible, directly
20 incorporating a computerised system which does not exclude the
function of a microprocessor with both organic and non-organic
material, including the function of intelligence which may or may
not be artificial, similar to cerebral functions, and also
visualisation or non-visualisation with different grades of variable
25 luminosity materials by means of electronically induced
phenomena which cover the entire range of the spectrum.

Background Art

According to the current state of the technology, the

- liquefied material to be deposited (3) in order to form the said layer on the said support (S). The distribution unit is programmed to move transversally in a controlled manner by a
 - microprocessor, similar to that of a traditional inkjet printer,
- 5 with the said distributor having a number of nozzles for the distribution of points the equivalent of pixels, which are able to cover a certain area equal to $n \times d$, where "n" is the number of nozzles which are sprayed in line, and "d" is the distance along the line from one nozzle to another, with a layout, for example,
- 10 along three lines alternately disposed, 1, 2, 3, for a length of 70mm.
- The forward progress of the underlying support is in steps of 70mm, up to the complete deposit on the surface of the support in question (S).
- 15 Figure 2 illustrates the feeding system of the liquefied material (which may be coloured, for example, with conductive powder in suspension in the various containers with a respective electro-induced vibration mixer), which ~~basically~~ comes from a main container 4 with a cover for loading 40.
- 20 This container has two tubes for the liquefied material: one is the feed line 41 by means of a solenoid check valve 410 to a pressure equaliser and regulator 5 which will be described in detail in the successive function, and a return line 71 from a recovery and recycling container of the same liquefied material 7,
- 25 the function of which will be described later.

In this description, the liquefied material means the said material used for the formation of the said layering of electronically-interactive material used to cover the said support

In this case, the fluid which is fed for the washing phase, which is neither polluted or damaged, is recovered by the said tank from below the nozzles in the said distributor means for **point-type sprays** (31), and

5 taken by means of the said pipe 71 to the said main container 4.

All three of the containers 4, 5 and 6 have a vibration unit inside to keep the liquid constantly in motion during the feeding operation, in order to keep the suspended substance, which is heavier than the liquid, uniformly distributed (eg. copper powder
10 for the conductivity of the material, pigments for the insulating material, etc.)

The ultra-violet (UV) ray device 34 advantageously works at room temperature and, because it heats up, it is cooled down at the same time according to a controlled temperature by suitable
15 equipment which is part of the machine. In this way, the polymerisation of the deposited material is carried out at room temperature without damaging the material or the support, and without compromising the functionality of the entire depositing unit (3).

20 The distribution nozzles for the material to be polymerised by means of the distribution unit for **point-type sprays** (31) are advantageously conformed to supply punctiform (pixel-by-pixel) sprays equal to 1 pixel at time in logical succession.

There are one or more rows of distribution nozzles. More
25 rows of nozzles or distributors may be foreseen in order to deposit different materials.

An example of different materials could be the following, for example:

- conductive material;

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CLAIMS

1. A system for the formation of a layering of electronically-interactive liquefied material, which is ~~may be~~ solidified /polymerised, on a support surface formed by a sheet/ ~~or card or~~
 5 ~~on a support panel (S), in which a starting pressure of the distribution depositing material p1 is higher than the successive pressure p2 of distribution depositing of said material,~~
 characterised by the fact that:
- a computer controlled machine is used, with a mobile support
 10 bed which goes backwards and forwards (2, 20, Y) with a transversal bridge passing over it and which has transversal guide means for the alternate transversal movement, above the said **mobile support** bed, of a distribution unit for the material (3), in which there is a distribution means for point-
 15 type sprays (31) at programmed differential pressure, equipped with a series of punctiform nozzles to distribute respective points of the liquefied material, which ~~basically~~ correspond to pixels, in a controlled, programmed way;
 - the said sheet/ ~~or card type support or support panel~~ (S) is
 20 fastened on the surface of the said mobile **support** bed (2), and
 - (i) the said mobile support bed (2), on which there is the said sheet/ ~~or card type support or support panel~~ (S), is moved forward (Y) according to the program below the said bridge and below the said distribution unit (3);
 - 25 (ii) the said distribution unit (3) is moved transversally above the said sheet/ ~~or card~~ (S), and the said distribution means deposits, by means of points (31), and according to a programmed design, at least one layer of the said electronically-interactive material, with

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differentiation of the distribution pressure of the said liquefied material at two different values p_1 and p_2 , where:

" p_1 " is the pressure at the start of the distribution and depositing phase, and

- 5 "p2" is the continuous pressure during the distribution of the deposit, wherein

$$p_1 > p_2;$$

- phases (i) and (ii) being repeated until the whole of the required surface interested area of the said support sheet/ or
10 card (S) is covered, and ~~wherein being~~ **provided further means that**, during the non-operational phase, ~~it is possible~~ **are able** to apply a supply pressure " p_3 " > " p_1 " in order to clean a respective filtering system in the feeding system of the said liquefied distribution-depositing material.

- 15 2. A system ~~for the formation of a layering of electronically-interactive liquefied material, which may be solidified/polymerised, on a support surface formed by a sheet/ or card or on a support panel (S)~~ according to the previous claim, characterised by the fact that, to the side of the said distribution
20 means **for point-type sprays** (31), there is an ultra-violet ray head which is suitable for polymerising the said electronically-interactive liquefied distribution-depositing material.

3. A system according to the previous claim 2. , characterised by the fact that the said ultra-violet polymerisation head is
25 electronically controlled ~~able~~ to supply the energy required to fix the said material on the said support (S).

4. A system ~~for the formation of a layering of electronically-interactive liquefied material, which may be solidified/polymerised, on a support surface formed by a sheet/ or~~

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- ~~card or on a support panel (S)~~ according to the previous claims, characterised by the fact that, to the side of the said distribution ~~unit means for point-type sprays~~ (31), there is an ultrasonic distance sensor (32) which detects the distance of the said
- 5 distribution means (3) from the depositing surface on the ~~respective support said sheet/card (S)~~, and which transmits the respective data to the computerised means which controls the movement of the said distribution means (3).
5. A system ~~for the formation of a layering of electronically-~~
- 10 ~~interactive liquefied material, which may be solidified/polymerised, on a support surface formed by a sheet/ or card or on a support panel (S)~~ according to the previous claims, characterised by the fact that, to the side of the said distribution ~~unit means for point-type sprays~~ (31), a television camera
- 15 (33) is installed, which has the function of controlling and fine tuning the start, and checking the regularity and conclusion of the distribution-depositing operation.
6. Computer controlled machine for the depositing of a liquefied electronically-interactive material on a sheet/ ~~or card (S) or on a~~
- 20 ~~support panel~~, for implementing the system according to the previous claims, characterised by the fact that it includes:
- a base (1) to support the mobile bed (2) which is moved longitudinally (Y) by means of a worm screw (20) whose movement is controlled by a computer, and for the support and

25 fixing of the said ~~support sheet/card/panel~~ "S" on which the layer of electronically-interactive material is to be formed;

 - a bridge above the said base with a transversal shaft (30) which also has a worm screw, to move a distribution unit for the

electronically-interactive material to be deposited (3) in an

30 orthogonal direction (X) controlled by the said computer;

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- the said distribution unit (3), with a pressurised distribution means with a series of nozzles for pixel punctiform sprays, fed by a buffer container (6) and above with the fed liquid material in the lower part "L" and air chamber "A", while to the side there is a pressure balance and regulation chamber (5) with its feed line (51) on the bottom (L) of the said buffer, and supply of the said liquid material from a feeder container-tank (4), where all of these containers (4, 5 and 6) have an agitation means and in which, the said pressure balance and regulation chamber (5) has a level indicator (51) and is guided parallel to the said distribution means for point-type sprays (31) when rising and lowering, and in which there are means for varying and regulating the height of the said pressure balance and regulation container (51) to increase or reduce the pressure on the said buffer container either positively or negatively due to the difference in the level in a regulated way.

7. A **computer controlled** machine according to the previous claims 6, characterised by the fact that the said feed container-tank (4) includes a connection to a tank (7) located at the side and which ~~may be~~ is covered by the said distribution means for point-type sprays (31), so that the said liquid material ~~may~~ is able to be recovered and recycled at a recycle pressure of "p3", which is higher than the said distribution-depositing pressures "p1" and "p2", to carry out a cleaning cycle of the respective filtering means located upstream of the nozzles in the said distribution means.

8. A **computer controlled** machine according to claims 6 and/or 7, characterised by the fact that the said punctiform spray nozzles are positioned in a longitudinal direction (Y) with respect to the direction of movement of the said bed (2) in at least one row.

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9. A **computer controlled** machine according to claims 6 to 8, characterised by the fact that the said punctiform spray nozzles are positioned in a longitudinal direction (Y) with respect to the direction of movement of the said bed (2) in a number of rows.

5 10. A **computer controlled** machine according to any of the previous claims 6-9, characterised by the fact that, to the side of the said distribution means, there are:

- cooled means for transmitting ultra-violet rays for polymerising the said material which is deposited (34);

10 - means for controlling the distance from the surface to be deposited (32) and

- a television camera (33),

which are all connected interactively to send their respective data to the machine's microprocessor in order to carry out the

15 respective control operations according to the program.

11. A **computer controlled** machine according to any of the previous claims 6-10, characterised by the fact that it has more than one distribution device (3) in the distribution unit for materials with differentiated electronically-interactive

20 characteristics, among which at least one is actively electronically-interactive and one is non-actively electronically-interactive, or an insulator.

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